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ABSTRACT

Changing patterns of demand for higher education services have generated considerable interest in research into the factors governing the choices students make when they apply to colleges and universities. During 1973, the staff of the State Budget Division of New York State undertook the task of creating a general model of the demand for college services. The model was derived from the theory of consumer demand, which postulates that the demand for any commodity is a function of consumers' tastes, incomes, and the relative prices they face. The 4 basic factors selected as the variables determining demand were: academic quality, social aspects of the undergraduate experience, where the school is located, and costliness. Conclusions are: (1) Academic policy does influence the decision to apply to a particular college, but the quality of the student body seems to be the most important factor in the determination of a student to apply. (2) Relative pricing policies of particular colleges are very important in determining the student's choice of where to apply. (Author/PG)

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Estimating Demand for Higher Education Services

Changing patterns of demand for higher education services have generated considerable interest in research into the factors governing the choices students make when they apply to colleges and universities. Recently, one unit of New York State government has undertaken some preliminary research into this subject. More substantial and sophisticated efforts are also under way as part of an inter-agency cooperative research project which has as its objective the development of a model of the demand for higher education services in New York State. This article, written by Walter T. Kicinski, chief, and Neal M. Soss, staff economist, of the Program Analysis and Review Unit, New York State Division of the Budget, describes this potentially significant effort and includes the preliminary results of research already completed.

In many states, including New York, the problem of matching the demand for higher education services with the available supply of those services seemed relatively straightforward during the 1960's. The problem as it was then understood could best be described as "how to develop the supply of these services rapidly enough to meet a burgeoning demand for them." In most states, again including New York, the solution seemed just as straightforward. We would simply build enough new public college places in the State to meet the growing demands for higher education places in excess of what was available in private and public institutions.

In the 1970's these questions are marked by new complexities. In seeking appropriate solutions to the supply-demand relationships in the higher education system, policy-makers can no longer assume that monies will be available for public sector supply expansion and, even more importantly, they can no longer assume a continuous and rapid growth in demand. Many planners and policy-makers are newly aware that they bear the responsibility for critical choices affecting the supply-demand balance in the higher education system, and that the way in which they make those choices has tremendous implications for individual students, institutions and for the general public interest.

This basic shift in focus should emerge rapidly in the years ahead as we move from a period of relative abundance to a period of relative scarcity in the numbers available for each new freshmen class. The key set of policy questions which must be answered during this period will center upon the issue of how to allocate most efficiently a limited demand for higher education services among the mixed set of institutions which constitute our higher education system. Before we can begin to postulate alternative strategies for an efficient allocation of demand for higher education services, however, we must first undertake basic research into the definition and dynamics of that demand in order to better understand its relationship to potentially flexible aspects of the higher education system. The expected result of these research efforts will be a potential for greater insight on the part of State policy-makers into the questions surrounding an appropriate allocation of the demand for postsecondary education across the various public and private institutions of higher learning in the State.

Preliminary Research

During the past year staff of the State Budget Division undertook the task of creating a general model of the demand for college services. The model was derived from the general formulation of the theory of consumer demand which postulates that the demand for any commodity is a function of consumers' tastes, incomes, and the relative prices they face.

The measurement of demand for a college's services selected is the number of applications for admission filed. By using the college as a unit of analysis and the number of applications to each college (as a relative share of the total) as an index of demand for its services we sought to explain why certain colleges received more applications than others.

It is recognized, of course, that one unit of college services (a place in a particular college or university

freshman class) is not necessarily the same as another. College services are not homogeneous, since each institution attempts to differentiate itself from other institutions as an implicit contributing factor in its continuing appeal to potential students. In fact, it is assumed that a major consideration in the analysis and application of demand models for college services, in terms of potential alternative public policies, should be the desirability of retaining as much of this diversity as possible.

In order to account for the non-homogeneity of the "commodity" offered to students by institutions of higher learning we assumed that the college market is characterized by monopolistic competition with product differentiation. In other words, we assume that the demand for a college's services derives from several characteristics in addition to price. The four basic factors selected as the variables determining demand were hypothesized as follows:

- academic quality
- social aspects of its undergraduate experience
- characteristics of the market in which it is located
- costliness.

Before going on to describe in more detail the exact variables used to examine these four aspects of college demand, and the results obtained from such examination, the limitations of this particular research effort must be clearly understood.

There exist no published set of data on the number of applications received by various colleges in the United States. Consequently, our index of demand had to be constructed by direct questioning of a sample of high school seniors. A major East Coast University made available the results of a national survey of the parents of students entering college for the first time in the fall of 1971. These students were selected at random from the list of high school seniors who took the College Entrance Examination Board's Scholastic Aptitude Tests (SAT) in the 1970-71 academic year and achieved a total of 1100 or more points (Math and Verbal). A total of 1617 such families were surveyed and responded to questions which indicated, among other things, the colleges to which applications had been filed. The number of applications filed by students in this sample to each college in the United States was then constructed to serve as the dependent variable.

Methodological considerations, primarily of a statistical nature, required us to limit the analysis only to the applications made at the 442 secular four-year colleges (both private and public) which appeared in the sample. It is not clear, therefore, to what extent the results can be generalized to describe the demand for two-year colleges or four-year Catholic and sectarian colleges. A second major limitation, inherent in the use of this data, is that the model in this case is obviously related to the behavior of a highly selective group of college applicants, those with combined SAT scores in the top 30%. Although our estimates capture fairly closely (by statistical tests) the behavior of these students, they are not readily extendable to the description of the behavior of lower-aptitude applicants. It is possible to speculate that a sample of lower-scoring students would respond less strongly to variations in academic quality and more strongly to cost variations.

In constructing our model, these data on college applications were merged with data from the American Council on Education's College Characteristics File on academic quality and social environment factors (1966-68 period). Data on the cost factor were obtained from the College Scholarship Service estimates of student expense budgets for 1971-72, which include in the cost of attending a particular college tuition and fees, room and board charges, and commuting expenses. Data on the market characteristics factor were constructed using the same student sample noted above.

Measuring Academic Quality

Four variables were used to examine the impact of academic quality on high-aptitude applicant demand for college services. These include:

- median SAT score of entering freshmen, a measure of student quality
- the student-faculty ratio, a conventional measure of academic quality
- % of faculty with the Ph.D. and the amount of sponsored research (measured in dollars) conducted at the institution, both measures of faculty quality.

These variables are all statistically significant in helping to explain demand for college services, but the "student quality" measure is by far the most powerful factor among them. For example, a 10 point increase in the median SAT score of a college's enrolled freshmen is estimated to increase the odds of the college's receiving the average application of a high-aptitude applicant by some four and a half per cent. A unit decrease in the student-faculty ratio (i.e., one less student per faculty member) and a one percentage point increase in the proportion of the faculty with the Ph.D. are about equally potent—each increases these odds by about one per cent. A million dollar increase in sponsored research increases the odds of receiving the average application by only two-thirds of one per cent, indicating that sponsored research may have little relation to the relative attractiveness of the educational experience.

In summary of the "academic quality" variables, it seems clear that a high-aptitude sample of students does respond favorably to improvements in the academic

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quality of a college, but it is evidently more responsive to the relative quality of the student body than it is to the relative quality of the faculty of the college. Also, a downward adjustment in the student-faculty ratio is not a particularly efficient means of increasing the number of high-aptitude applicants.

Measuring Social Environment

Three variables were used to examine the impact of social environment on demand, including:

- size of the freshman class
- residential capacity of the campus as a proportion of total enrollment
- sex ratio of the student body.

Both size of the freshman class and the sex ratio of the student body were found to be fairly significant factors in influencing demand. The "residential capacity" factor was not a significant variable, as was also the case for several other variables which were tried, including a dummy variable, whether or not the college allowed students to maintain automobiles, and a variable measuring the proportion of foreign students in the student body.

In the case of class size an increase of 100 in size of the freshman class is estimated to increase the odds of receiving the average application filed by students like those in the sample by 2 per cent. In other words, college applications from high-aptitude students do to some extent follow expansions in the number of freshmen places.

The optimal coeducation rate from the point of view of attracting high-quality applicants, based on our estimates, was about 60 per cent male. The more basic implication of these estimates is that although small deviations from the "optimal" sex ratio do not decrease the odds of receiving applications very much, extreme ratios of single-sex colleges are much less desirable to high-aptitude applicants than are coeducational ones.

Summarizing the "social environment" variables, they seem generally to have a less potent influence on the choices of high-aptitude college applicants than do the "academic quality" variables. On the other hand, our research does imply that co-educational institutions and those that have expanding freshman classes do maintain some fairly significant advantages in attracting these applications.

Measuring Market Characteristics

Two variables were used to examine the influence of market location characteristic variables on demand for colleges, including:

- number of sample students from the same state as the college (assumption that proximity to the college increases the demand for its services)
- number of these same-state sample students with family incomes above $15,000 (assumption that higher-income students are more likely to disregard the proximity of the college in making an application).

In summary, a 100 student increase in the number of sample students living in the same state as a particular college will increase by 20 per cent the odds that the average application filed by the sample students will go to the college. This seems to confirm the expected positive relationship between demand and proximity to a college, since the increase in odds noted presumably results from the stronger propensity of students to attend a home-state college. There is no significant statistical evidence that level of income is an important variable in determining demand based on proximity.

Considerations of Cost

Finally, we turn to the variable which has attracted most attention in previous discussions of the demand for college services, the influence of the *relative cost* of a college on the number of applications it receives. The state in which a particular college is located was used as the market area in the construction of a relative price term for each college, with the price term defined as the price of the particular college dividend by the average price of all four year colleges in the state in which it is located.

We found a significantly negative relationship between the college's relative cost and its share in the total applications filed by sample students. The effect of cost in depressing demand was increasingly stronger as the college's price rose relative to the average price of its in-state competitors. In other words, a price increase at a college which is substantially out of line with average increases in other colleges in the same state substantially decreases the odds that the college will receive an application from a high-aptitude student.

The policy implications of this finding are significant. Changing the price of attending a college in the same direction and by approximately the same proportion as other four-year college prices in the state are changing will have a negligible effect on the allocation of the high-aptitude applicant pool at the various colleges in the state, but when one college or group of colleges gets out of line in its price changes, massive readjustments of the high-aptitude applicant pools may result.

This implication, is very significant when applied to the policy debate surrounding the price differential between public and private colleges. Because of the rapid expansion of public college enrollments in recent years, in many states, including New York, the pricing policies of the public colleges are increasingly important in determining where the "average" price of all colleges in the state will fall. In a year such as 1974, for example, when the average price of private colleges in New York State is expected to increase by about 10 per cent, while the price of public colleges remains stable or increases only slightly (through "living cost" increases), it can be expected that some substantial shifts of the high-

aptitude application pool may occur from the private college sector to the public college sector.

Implications for Policy

Summarizing the overall results of this research, the likelihood that high-aptitude students will apply to a particular college of the type included in our study is influenced by a number of the factors examined. Stating these results in terms of their significance for policy, they can be noted as follows:

- Academic quality does influence the decision to apply to a particular college, but the quality of the student body, rather than the quality of the faculty, seems to be the most important aspect of this factor in the determination of a potential student's choice to apply. This would seem to confirm the contention of college admissions officers that peer group influence is a major determinant in college selection.
- Relative pricing policies of particular colleges or sets of colleges are very important in determining the student's choice of where to apply. In particular, if private colleges, taken as a group, continue to experience relatively sharp price changes in comparison to public colleges, taken as a group, it is probable that there will be a significant shift among high-aptitude students from private to public colleges in making their choice of where to apply.
- Other factors examined do not seem to have policy implications which are as obvious, although it seems clear that the following factors have a positive influence on student application decisions: co-educational social environment; proximity of the college to the student; and an expanding freshman class.

Future Directions for Research

As already noted, there are several limitations on the preliminary research just described. Among these limitations are the high-aptitude of the sample students, the uncertainty surrounding the application of our results to two-year colleges and four-year Catholic and sectarian colleges, and perhaps most important for policy considerations in New York State, the lack of data-specificity for New York colleges and students.

In order to overcome these limitations and expand our perceptions of the dynamics of the demand for higher education services in the State to a more sophisticated level, a new and larger research effort has already been launched by the New York State Budget Division in cooperation with the State Education Department and the State University of New York. This new work has relied upon a joint effort with the staff of the Deputy Commissioner for Higher and Professional Education in the State Education Department.

The ultimate goal of this research effort is the empirical estimation of a set of demand functions for the services of institutions of higher learning in the State. This set of demand functions will allow us to predict which students will exercise effective demand for the services of which institutions in the face of particular configurations of college characteristics, especially tuition and student aid structures. Such information will aid State policy-makers who are concerned with the allocation of enrollment demand across the different sectors of the higher education system and with the socio-economic composition of this demand.

The specific goals of the study, in terms of the knowledge which we hope it will generate, are as follows:

- The responsiveness of enrollment demand at a college to changes in both its own characteristics and the characteristics of its competitors, with such characteristics to include price and college proximity, as well as academic and social attributes of the institution.
- Isolation of the most relevant characteristics and estimates of the relative importance of each.
- Determination of patterns of intercollegiate competition—which colleges compete with which others?
- How the various factors noted above vary for each college over different student types.

As of May, 1974, the analytical work on this research effort is well advanced. Most college and student characteristics data required for the study have been assembled, and the creation of enrollment data is almost completed. Actual estimation of the demand model should be completed over the Summer, with final results available for review by State policy-makers by the Fall of 1974.

The policy implications of this continuing research effort are clear both for individual college administrators and for Statewide higher education policy-makers.

Individual colleges will hopefully have an opportunity to gain new insights into the inter-relationships between their own college characteristics and the demand for their college services. For example, a college will be able to predict the likely results for its enrollment of changes in its tuition or some other key characteristics, given certain assumptions about the behavior of the rest of the higher education system.

Statewide policy-makers will have available a new research tool which hopefully will help inform them about the following kinds of policy-sensitive matters:

- the effects on revenue and student body of public college price changes
- the effects on private colleges of various public college policies, including the price of public colleges
- the effects of alternative allocations of State student aid
- insights into the significance of locational considerations in planning expanded college services.

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